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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/693,223

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Evan E. Patton

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04/21/2006

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EXAMINER

NGUYEN, HA T

ART UNIT

PAPER NUMBER

2812

DATE MAILED: 04/21/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/693,223

Applicant(s)

PATTON ET AL.

Examiner

Ha T. Nguyen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 February 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 28-38,40 and 41 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 28-38,40 and 41 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input checked="" type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Notice to applicant

1. Applicants' Amendment and Response to the Office Action mailed 10-14-5 has been entered and made of record .

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103 and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 28, 30-32, and 35-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rodbell et al. (USPN 6344129, hereinafter "Rodbell") in view of Ting et al. (USPN 6017820, hereinafter "Ting") and Vepa et al. (USAPN 2002/0004265, hereinafter "Vepa").

Referring to Figs. 1-3 and related text, Rodbell discloses [Re claim 28] a method of processing a semiconductor wafer comprising: electroplating copper on the wafer to fill high aspect ratio features and at least partially planarizing the wafer (see col. 8, line 37-col. 9, line 52). It is inherent that the step of (a) providing the wafer to an electrofill station exist and the electroplating step is performed in the electrofill station. **But** it fails to disclose expressly the steps of: (c) transferring the wafer to a second station in a module or cluster tool; and (d) in the

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second station, electromechanically polishing or electroplanarizing the wafer, (e) transferring the wafer to another station in said module or cluster tool; and (f) in the other station wet etching the wafer. However, the missing limitations are well known in the art because Ting discloses the use of a system with cluster tools to perform different process steps including electroplating and electropolishing; [Re claim 36] wherein the method is performed in an apparatus comprising separate modules for electroplating and polishing or planarization; [Re claim 37] wherein the electromechanically polishing or electroplanarizing is performed sequentially using a plurality of stations; [Re claim 38] performing metal chemical etching on the semiconductor wafer (See Fig. 1, col. 3, lines 5-57, col. 5, lines 22-37, and col. 6, line 24-col. 7, line 2) and Vepa discloses the use of stations to perform polish and wet etching separately (see pars 53-55, 62, and 66-67). A person of ordinary skill is motivated to modify Rodbell with Ting and Vepa to obtain better control of the manufacturing process with good flexibility.

[Re claim 40] In the combined teaching of Rodbell, Ting and Vepa the step of etching on the semiconductor wafer to remove copper is performed (see Rodbell, abstract).

[Re claims 30 and 41] As shown above, the combined teaching of Rodbell, Ting and Vepa discloses a method of processing a semiconductor wafer comprising: (a) providing the wafer to an electrofill station where copper is electroplated on the wafer to fill high aspect ratio features; (b) providing the wafer to a second plating station where copper is electroplated on the wafer to cover low aspect ratio features not filled during electroplating in the electrofill station (see also Rodbell, col. 9, lines 17-65); and (c) electromechanically polishing or electroplanarizing the wafer sequentially using a plurality of stations, wherein (a) - (c) are performed in an apparatus comprising separate modules for electroplating and planarization; wherein copper is electroplated on the wafer to at least partially fill low aspect ratio features not completely filled during electroplating in the electrofill station (see Rodbell, Fig. 2); [Re claims 31-32 and 35] wherein the copper is electroplated on the wafer to at least partially fill low aspect ratio features at a station other than the electrofill station; wherein the electrofill station includes an electrolyte comprising an additive; wherein the station in which copper is electroplated on the wafer to at least partially fill low aspect ratio features includes an electrolyte containing little or no additives (see col. 9, lines 17-65).

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Therefore, it would have been obvious to combine Rodbell with Ting and Vepa to obtain the invention as specified in claims 28, 30-32, 35-38 and 40-41.

4. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rodbell in view of Ting and Vepa, as applied above, and further in view of Ting et al. (USPN 6179982, hereinafter "US982").

The combined teaching of Rodbell, Ting and Vepa discloses substantially the limitations of claim 29, as shown above.

But it fails to disclose expressly wherein the electrofill electrolyte and the second electrolyte have different compositions.

However, the missing limitation is well known in the art because US982 discloses this feature (See col. 4, lines 5-31).

A person of ordinary skill is motivated to modify Rodbell, Ting and Vepa with US982 to obtain well controlled process steps.

Therefore, it would have been obvious to combine Rodbell, Ting and Vepa with US982 to obtain the invention as specified in claim 29.

5. Claims 33-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rodbell in view of Ting and Vepa, as applied above, and further in view of Dubin et al. (USPN6893550, hereinafter "Dubin").

The combined teaching of Rodbell, Ting and Vepa discloses substantially the limitations of claims 33-34, as shown above.

But it fails to disclose expressly wherein the additive comprises a suppressor, an accelerator, or both; and wherein the accelerator is selected from the group consisting of MPS, SPS, and DPS.

However, the missing limitations are well known in the art because Dubin discloses these features (See col. 3, line 7-col. 4, line 3).

A person of ordinary skill is motivated to modify Rodbell, Ting and Vepa with Dubin to obtain metal layer of desired quality.

Therefore, it would have been obvious to combine Rodbell, Ting and Vepa with Dubin to obtain the invention as specified in claims 33-34.

Response to Amendment

6. In view of applicants' cancellation of the claim, the rejection of claim 39 under 35 U.S.C. 103 is rendered moot.

In view of the new ground of rejection, applicants' arguments have been rendered moot.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for response to this final action is set to expire **THREE MONTHS** from the date of this action. In the event a first response is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event will the statutory period for response expire later than **SIX MONTHS** from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ha T. Nguyen whose telephone number is (571) 272-1678. The examiner can normally be reached on Monday-Friday from 8:30AM to 6:00PM, except the first Friday of each bi-week. The telephone number for Wednesday is (703) 560-0528.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael S. Lebentritt, can be reached on (571) 272-1873. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications

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may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

HN

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Ha Nguyen

Primary Examiner